REMARKS/ARGUMENTS

1.) Claim Amendments

Claims 1, 3, 5-15, 17, 19-23, 25-27, and 31-41 are pending in the application. The Applicants have amended claims 1, 9, 11-13, 25, and 41. Favorable reconsideration of the application is respectfully requested in view of the foregoing amendments and the following remarks.

2.) Allowable Subject Matter

In the Office Action Summary and on page 22 of the Office Action, the Examiner indicated claims 13 and 14 are allowed and claim 12 is objected to for depending from a rejected base claim. On page 3, however, these same claims appear to be rejected under 35 U.S.C. § 101. The Applicants presume claims 12-14 are conditionally allowed, subject to overcoming the § 101 rejection.

Claim 12 has been amended to overcome the § 101 rejection, and has been rewritten in independent form to include all of the limitations of base claim 11. Therefore, the allowance of claim 12 is respectfully requested.

Independent claim 13 has been amended to overcome the § 101 rejection. Therefore, the allowance of claim 13 and dependent claim 14 is respectfully requested.

3.) Claim Objections

On page 2 of the Office Action, the Examiner objected to claim 25 for depending from a canceled base claim. Claim 25 has been amended to depend from claim 23. Withdrawal of the objection is respectfully requested.

4.) Claim Rejections – 35 U.S.C. § 101

On pages 2-3, the Examiner rejected claims 1, 3, 5-14, 31-38 and 41 under 35 U.S.C. § 101 because they appear to be directed to an abstract idea rather than a practical application of the idea. The Examiner stated that the asserted practical

application in the specification of the graphics processing method is to perform the processing method in a portable electronic device.

The Applicants have amended independent claims 1, 9, 11, 13, and 41, to recite the step of utilizing results of the graphics processing to display enhanced graphics on an electronic display. This recitation is more precise than the Examiner's suggestion of performing the method in a portable electronic device. The withdrawal of the § 101 rejection is respectfully requested for claims 1, 3, 5-14, 31-38 and 41.

5.) Claim Rejections – 35 U.S.C. § 103(a)

On pages 3-4, the Examiner rejected claims 1, 5-11, 15, 19-22, 23, 26, 27, and 31-41 under 35 U.S.C. § 103(a) as being unpatentable over Xie et al. (US 6,525,726) in view of Larson (US 6,313,839). The Applicants respectfully disagree.

There are major differences between Xie and the claimed invention. Xie describes a system that performs depth buffer culling in a way that is very different from the claimed invention. For example, Xie performs ZMAX-culling, whereas the claimed invention performs ZMIN-culling. These are two completely different processes. In ZMAX-culling, such as done in Xie, the goal is to identify triangles that are guaranteed not to be visible --- they can therefore be removed without changing the result. In contrast, in ZMIN-culling, such as done in the Applicants' claimed invention, the goal is to identify triangles that are guaranteed not to be obscured --- and can consequently be drawn without reading the z-buffer.

Larson uses both ZMIN and ZMAX, but the combination of Larson and Xie does not suggest a method using only ZMIN. Xie clearly teaches away from such a solution. In each of the main claims (1, 7, 12, 16, 17, 23, 24), Xie states the following:

1. The polygons are rendered in depth order;
2. It is evaluated whether a coverage parameter has been satisfied;
3. It is determined whether the polygon is occluded; and
4. The coverage parameter is proportional to an estimated cost.

In contrast, the Applicants' claimed invention:

1. Does not render polygon in depth order (any order is possible);

2. Does not evaluate whether a coverage parameter has been satisfied (no such parameter exists in the claimed invention);

3. Does not determine whether the polygon is occluded (instead the claimed invention determines whether the polygon is guaranteed NOT to be occluded); and

4. Does not use a coverage parameter that is proportional to an estimated cost (again, the claimed invention does not have this parameter).

Item 3 highlights the difference once again that the claimed invention utilizes ZMIN culling instead of ZMAX culling. Additionally, items 1, 2, and 4 indicate other aspects of the claimed invention that are different from Xie and Larson.

The Applicants also note that several of the Examiner's interpretations of both Xie and Larson are incorrect. These are discussed below.

On page 4 of the Office Action, the Examiner states:

> Xie teaches setting occlusion flags for respective tiles of a row of tiles for a graphics primitive based on whether respective representative depth values for the tiles of the row of tiles meet an occlusion criterion in column 5 lines 1-2 ("Polygons which are determined to be visible, at least partially, by the HZ buffer test..."), as shown in Figure 2 as step 50, where it is described that as occlusion is tested, an indication of the results of the test is recorded to represent the visibility.

This is not correct. It is true that Xie et al tests whether the polygon is visible, but if it is not visible, the polygon is simply discarded, and if it is visible, the polygon is drawn. The result of the visibility test is never stored as a flag anywhere, and hence never reused at a later time anywhere. This is clear when looking at step 50 as the Examiner described above. Step 50 reads, "Perform HZ test for polygon visibility". Xie does NOT state, "an indication of the results of the test is recorded to represent the visibility", as the Examiner asserts.

Furthermore, column 4 row 64 to column 5 row 2 in Xie reads, "At box 50, if the HZ buffer 100 has already been constructed, each remaining polygon in that bin is tested against the HZ buffer 100. In box 52, any polygons determined to be occluded by the HZ buffer test are discarded." Thus, if the polygons are not visible, the process

jumps to box 52 and discards the polygons. No visibility flag needs to be stored. Thus, Xie does NOT teach setting occlusion flags for respective tiles of a row of tiles for a graphics primitive based on whether respective representative depth values for the tiles of the row of tiles meet an occlusion criterion.

The examiner continues on line 17 on page 4:

> Xie teaches processing a portion of pixels in a first tile of the row of tiles responsive to the occlusion flags and depending on the geometry of the primitive, processing pixels in a second tile of the row of tiles responsive to the occlusion flags before processing additional pixels in the first tile responsive to the occlusion flags in column 8 lines 58-67 ("the tiles of display screen 18 are processed sequentially ... The process also goes to box 132, in an "early bailout" mode as mentioned earlier, if the nearest Z extent of the bin is further than the furthest Z-buffer value in the tile, indicating that no further polygons in this bin are visible."), where it is described that once a first tile is processed, a second subsequent tile may then be processed before processing additional portions of the first tile.

This is also not correct. Xie is a fully tile-based system, where first all triangles that are intersecting tile 1 are rendered, triangle by triangle. Not until all those triangles have been rendered to tile 1 does the process go to the next tile, tile 2, where it renders all the triangles that intersect tile 2. Then the process goes to tile 3, etc. This is what is meant when Xie states, "the tiles of display screen 18 are processed sequentially" as cited by the Examiner above: first tile 1, then tile 2, etc. An "early bailout" of tile 1, for instance, only means that the processing of tile 1 can be stopped at an early stage, since no more triangles can be visible in that tile. This does NOT mean that the process later goes back to tile 1. It does not have to since no more triangle can be visible in that tile. Xie NEVER describes the partial processing of one tile, then processing a second, and going back to the first tile. This is also clear from column 1 in Xie, rows 49 through 64, where it states, "High output bandwidth implies high cost memory for Z-buffering and for anti-aliasing (reducing stair-stepping or jagged lines that sometimes occur on a display screen). This cost can be kept down by using a tiled architecture that renders the scene one tile or chunk at a time and reduces the fast expensive memory for each tile".

Here it is described that the memory for Z-buffering can be reused between tiles and it is therefore possible to lower this expensive memory from an entire screen of, say 1024x1024 pixels to a tile of size 16x16 or 128x128, for instance. If one were to partially process one tile, process another one and then go back to process the first tile, (as the Examiner proposes that Xie is doing), then it would not be possible to reuse the same memory for Z-buffering between tiles.

Thus, Xie does NOT teach processing a portion of pixels in a first tile of the row of tiles responsive to the occlusion flags and depending on the geometry of the primitive, processing pixels in a second tile of the row of tiles responsive to the occlusion flags before processing additional pixels in the first tile responsive to the occlusion flags.

Regarding Larson, on page 5, line 14 of the Office Action, the Examiner states:

> Larson implicitly teaches comparing the maximum depth value to the cache occlusion threshold depth value for the tile in the tile occlusion information cache, in column 6 lines 25-27 ("The received Z value is then compared with the Z MIN value. If the received Z value is less than Z MIN, the primitive is visible.")

Once again, this is not correct. While Larson does test against Z MIN and Z MAX, Larson does it pixel by pixel. Thus, the first pixel to be drawn in the region is tested against Z MIN and Z MAX, then the second pixel is tested against Z MIN and Z MAX, etc. This is very clear in a number of places in Larson, such as column 4, lines 47-50 where it states, "The Z value of the first pixel of the region is then compared to the Z MAX value to determine whether the pixel Z value is greater than the Z MAX value..." It is also clear from column 4, lines 52-53 where it states, "... where a determination is made as to whether the region contains any more pixels to be compared."

Likewise, for Figure 4, Larson states in column 5, lines 59-60, "... a determination is then made as to whether the received Z value is greater than Z MAX, ..."

In column 5, lines 63-65, Larson states, "The process then proceeds to block 77 and the next Z value to be tested is obtained. A determination is made as to whether the Z MIN and Z MAX values for the next pixel to be tested are ..."

In this light, it is clear that the lines that the Examiner cited from Larson refer to a per-pixel test. Thus, when Larson states in column 6, lines 26-28, "The received Z value is then compared with the Z MIN value. If the received Z value is less than Z MIN, the primitive is visible," this means the primitive is visible for that pixel.

In sharp contrast, the claimed invention does not deal with a per-pixel test against Z MIN. Instead the claimed invention recites "determining a maximum depth value for the graphics primitive within the tile" (claim 1 and others) and this maximum depth value for the tile is compared against Z MIN. This is much more efficient, since it only needs to be performed once per region (tile) instead of once per pixel. For instance, if the tile size is 8x8 and all of the pixels are to be written by a primitive, Larson must do one test per pixel (64 tests), whereas the claimed invention needs to do only one test. This is a substantial savings in terms of computation.

Thus, Larson does NOT teach comparing the maximum depth value to the cache occlusion threshold depth value for the tile in the tile occlusion information cache.

For all the above reasons, the combination of Xie and Larson does not teach or suggest the claimed invention. Therefore, the withdrawal of the § 103 rejection and the allowance of claims 1, 5-11, 15, 19-22, 23, 26, 27, and 31-41 are respectfully requested.

On page 21, paragraph 2 of the Office Action, the Examiner rejected claims 3, 17, 25 and 37 under 35 U.S.C. § 103(a) as being unpatentable over Xie, in view of Larson in further view of Wood (US 6,204,856). However, as noted above, Xie and Larson do not teach or suggest the elements of the invention asserted by the Examiner. Wood does not overcome the deficiencies in Xie and Larson. Therefore, the combination of Xie, Larson, and Wood does not teach or suggest the invention recited in claims 3, 17, 25, and 37. Therefore, the withdrawal of the § 103 rejection and the allowance of claims 3, 17, 25, and 37 are respectfully requested.

CONCLUSION

In view of the foregoing remarks, the Applicants believe all of the claims currently pending in the Application to be in a condition for allowance. The Applicants, therefore, respectfully request that the Examiner withdraw all rejections and issue a Notice of Allowance for claims _____.

The Applicants request a telephonic interview if the Examiner has any questions or requires any additional information that would further or expedite the prosecution of the Application.

Respectfully submitted,

Steven W. Smith

Date: FEB. 14, 2007

Steven W. Smith
Registration No. 36,684

Ericsson Inc.
6300 Legacy Drive, M/S EVR 1-C-11
Plano, Texas 75024

(972) 583-1572
steve.xl.smith@ericsson.com